The EMU Alignment Readout Architecture.
(Draft Proposal)

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Component Types

There are but five different types of components in the EMU alignment system, and all of them are located on, or near, four YX planes (in CMS coord) at each of the two endcaps. Three of those planes are along the EMU stations, while the fourth one contains the MAB sensors.

1. Laser modules
2. 2-D sensors and readout boards
3. R-sensors (Radial pots)
4. Z-sensors, and
5. T-sensors (temperature probes)

The 'conventional' approach

1) There are several different ways to organize the readout. The present scheme, or default solution, will have:

1. the readout boards next to their corresponding 2-D sensors, and their outputs then connected to the data nodes. That makes the critical components at once more vulnerable and less accessible.
2. the data nodes joined along the transfer lines. That means the cable harnesses, as well as the network lines, must have connectors between each iron plate (or many more meters of extra length to accommodate the movements of the plates).

The New approach.

The architecture proposed here is represented in Fig 1, where the readout scheme for one the EMU station planes is shown.

Basic Ideas

The basic ideas are:

1. All signal, control, and power, lines for the alignment components of half of each SLM line, will be taken radially out and gathered into a data node. Such node will contain the signal conditioning, ADCs, and DSPs required to digitize the data.
2. All those data nodes, in one station plane, will be joined into a data loop (open or closed) that connects to the computer or to an appropriate multiplexer.

Thus there will be eight data loops that will eventually connected to a dedicated computer.

Considerations

The proposed arrangement has many advantages (only three of them will be discussed here):

1. The main readout components, which happen to be both critical and vulnerable as well, will be located in the most accessible regions of CMS. The feasibility of separating the 2-D sensors from the readout board (that contains the ADC's and DSP), have been tested (for up to 8m at FNAL and Northeastern, with COPS).
2. The radiation exposure, as well as the magnetic field intensity, is greatly reduced, at the data node locations.
3. The cabling (or harness) for each data loop are on separate iron plate, thus avoiding the need to disconnect, and reconnect, them whenever the iron plates are to be separated either from the barrel, or from each other.

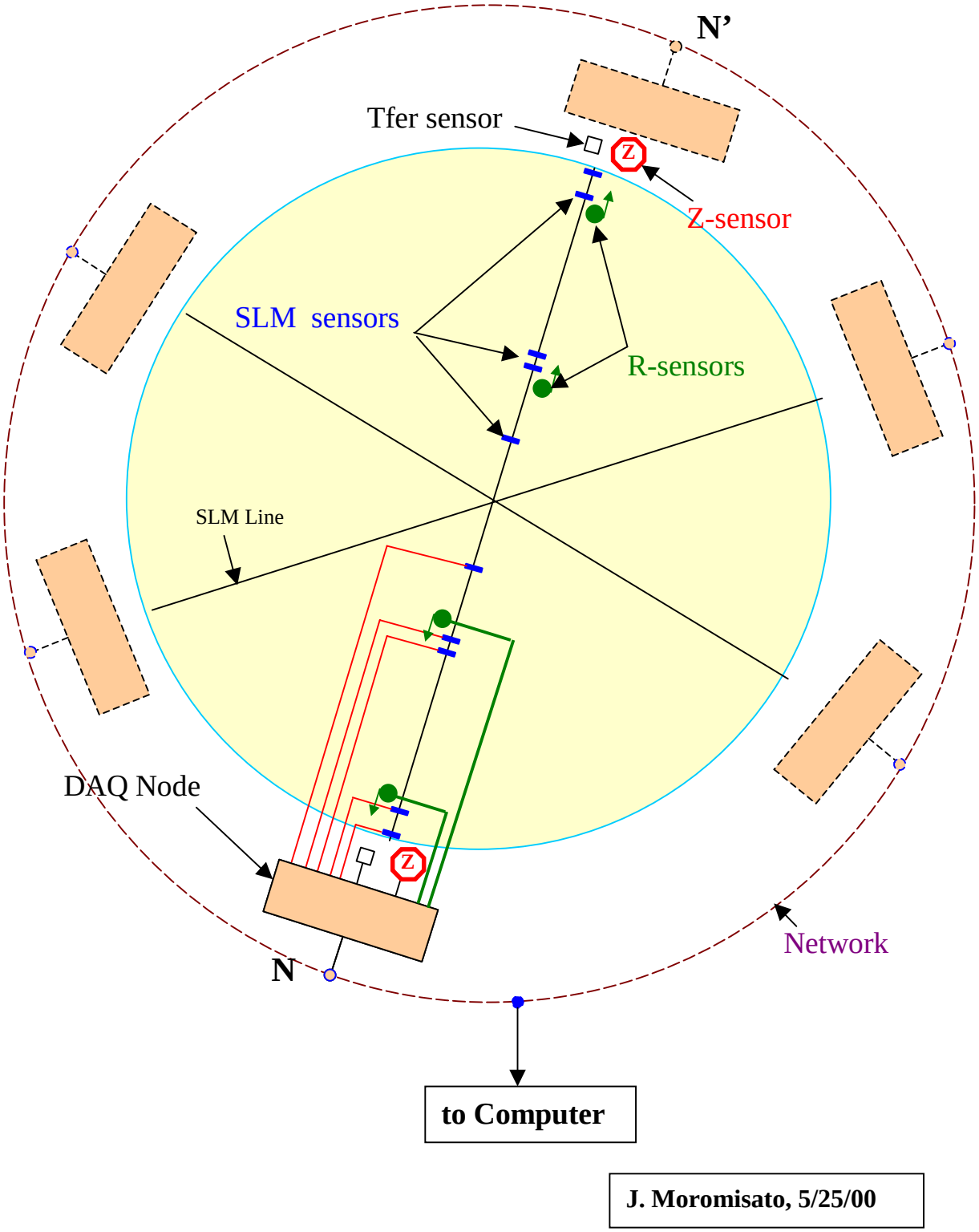
N'
Tfer sensor
Z
Z-sensor
SLM sensors
R-sensors
SLM Line
DAQ Node
Z
N
Network
to Computer
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FIG. 1